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GUIDE FOR PHYSICAL PLANNING OF
COMPUTER COMPLEXES

PART 1 LAYOUT

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GUIDE FOR PHYSICAL PLANNING OF COMPUTER COMPLEXES

PART 1 LAYOUT

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Indian Standard

GUIDE FOR PHYSICAL PLANNING OF COMPUTER COMPLEXES

PART 1 LAYOUT

0. FOREWORD

0.1 This Indian Standard (Part 1) was adopted by the Indian Standards Institution on 23 January 1986, after the draft finalized by the Computers, Business Machines and Calculators Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The computer centre planner is invariably confronted with the problem of locating the computer and associated equipment in an already constructed building. There are very few occasions when the computer centre planner would be given full freedom to select an ideal site, layout the various components of the computer centre and install such equipment in an idealistic manner without any restrictions being imposed on him. Therefore, modifications and alterations to existing buildings would be required to be made by the computer manager, taking guidance from this standard, whenever applicable.

0.3 Organizations have started relying heavily on computer based information of late. Therefore, the entire operations of the organization could grind to a halt if there is any break down in the functioning of computer. Such breakdowns could assume catastrophic proportions and every effort must be made to prevent the occurrence of such breakdowns. In this attempt, a layout encouraging smooth flow of both data and personnel, without major hindrances would be of great importance. Therefore, any marginal increase in cost likely to be incurred in choosing a computer layout should not be treated as an extra expenditure nor should any economy be attempted in the process.

1. SCOPE

1.1 This standard (Part 1) aims at giving general principles of layout of computer complexes so as to meet the needs of security, safety, economy and overall efficiency in data processing activities.

1.2 These guidelines do not purport to give detailed blue prints of layout for computer complexes.

2. TERMINOLOGY

2.1 For the purpose of this standard, the terms and definitions as given in IS : 1885 (Part 52) * shall apply.

3. GENERAL

3.1 In any computer complex, considerable attention to detail would have to be paid at the planning stage itself in order that the various elements of the complex are laid out for optimally efficient and effective functioning. This imposes a great degree of challenge on the part of the planner of the installation constrained as he is by lack of money, space and other facilities.

3.2 The ultimate goal of all computer installations would be to provide accurate and timely information to the concerned organizational wings; the planner must not however, lose sight of the physical comforts of the personnel working in the computer complexes on the one hand and the aesthetic features of the installation on the other. Due consideration must be given to provide for pleasing natural surroundings wherever possible such that personnel working in computer centres could break the monotony of working in an artificially lighted and aired, environment.

3.3 Computers are now being manufactured in different varieties sizes and complexities. Therefore, it would not be easy to provide one standard guideline for computer installations of all hue and colour. The problem become all the more difficult with the advent of micro-computers which have a capacity to perform operations normally undertaken by large computers in the earlier decades. It must be noted, however, that the principles of lay-out of a computer installation with regard to the flow of data, layout of cables, positioning of important operational personnel, leading-in of all communication lines/cables, movement of personnel etc, would be common to all computer installations whether such installations house maxi-computers, midi-computers, mini-computers, micro-processors or whatever. To the extent possible, natural lighting must be provided in order to obviate the need for large-scale artificial lighting.

3.4 Considering the fact that large computers need heavy investment, the manufacturers and suppliers of such large computers would be of their own volition be rendering the appropriate advice to the installation managers with regard to the most optimal layout. This may also apply in respect of well established manufacturers who, when selling their system, insist on adopting a turn-key approach to the computer installation without being confined, to pure supply of equipments. These

*Electrotechnical vocabulary : Part 52 Data processing.

guidelines would, it is hoped, help those computer centre managers who are not in a position to get advice from qualified experts on matters relating to layout of various components of their computer complexes. Since no unique standards on layout at the national or international level was available, documents prepared by large computer manufacturers in different parts of the world as also the layouts adopted by some important computer centres in India have all been referred to in the preparation of this standard.

4. ELEMENTS

4.1 The various facts of layout of a computer complex are discussed under the following headings:

- a) Principles of layout;
- b) Major components;
- c) Special requirements;
- d) A typical layout for computer installations; and
- e) Constraints and precautions.

5. PRINCIPLES OF LAYOUT

5.1 Some of the important principles to be adopted in planning the layout of a computer complex are as follows:

- a) The layout should be designed for maximization of throughput and providing efficient work flow by grouping various activity areas.
- b) The layout should allocate specific area for different activities such as main computer room, data reception, data preparation etc.
- c) The layout should provide flexibility for the purpose of reconfirmation and expansion in future.
- d) The layout should enable regulation of flow of personnel within complex such that free movement where essential and restriction where necessary are both catered for.
- e) The layout should place the ancillary services in optimum relationship to the computer system.
- f) The layout should facilitate rescue in case of calamity.
- g) The layout should facilitate implementation of security measures in the complex.

6. MAJOR COMPONENTS

6.1 Whatever be the size of the computer installation (whether it is based on a maxi-computer, mini-computer, midi-computer, micro-computer or whatever) some components would remain common. These components

can broadly be classified into three as: operational components; system support components; and administrative components. It is possible, however, that some of these components may be merged to suit the convenience of the local management depending not only on the size of the computer but also on the complexity of other needs.

6.2 Operational Components — The major operational components (as given in Fig. 1) as follows:

- a) Input control and job scheduling;
- b) Data preparation;
- c) Programme/Media library;
- d) Job assembly;
- e) Computer processing;
- f) Archival storage;
- g) Communication linkage;
- h) System maintenance; and
- j) Output control.

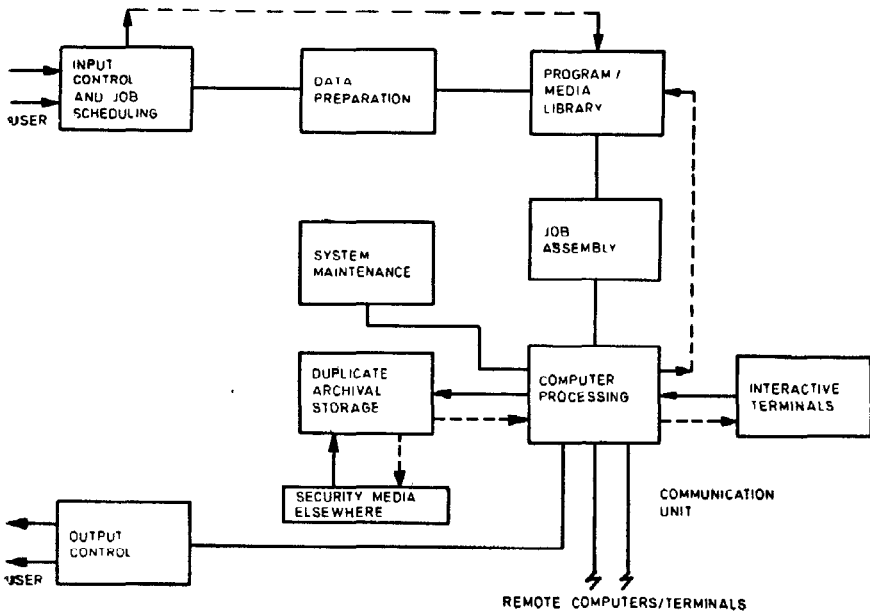


FIG. 1 MAJOR OPERATIONAL COMPONENTS

6.2.1 Input Control and Job Scheduling — All jobs meant for computer processing would normally be received at one place clearly designated

for the purpose. This sub-unit of the computer complex would accept requests from various users, assess the work load involved in the job, ascertain the likely duration of the job on computer and then inform the originator of the possible time the job is likely to take as well as the fact as to when the job would be undertaken for execution. At the time of informing the user, this stage would have taken care of scheduling the job depending on the current work load. This stage, namely, input control would make a request to the data preparation stage if data is required to be prepared before the execution of a particular job. If there is no such requirement, then the job would be routed to the programme/media library stage.

6.2.2 Data Preparation — All data required to be processed on the computer would have to be prepared in the form of cassettes, diskettes, magnetic tapes and so on (some installations in India still resort to preparation on punched cards while the majority of installations have gone over to magnetic media as the first stage of data preparation). The data preparation stage would have to maintain accurate record of various jobs handled by it as otherwise there is every likelihood of large scale loss of data. It would be good practice to not only maintain proper records for the data entered into magnetic media but also handle paper based documents received from the user with care because in case the original documents are misplaced, one will not be able to recheck the same too easily. It would be appropriate to insist upon the data preparation staff to incorporate their initials on every record keyed-in by them. Such a practice would facilitate locating the person who was instrumental in introducing errors, if any.

6.2.3 Programme/Media Library — One of the major components of input to computer processing is the programme which has to be run, as also the data, stored in magnetic media. For obvious reasons of economy of storage, it would not be possible to maintain all the programmes or data on-line all the time. Therefore, a well maintained programme and media library would prove to be an asset for the functioning of the computer. Back-up and security also would be on magnetic media.

6.2.4 Job Assembly — Once the required programme and data are retrieved from the library, they would have to be put together along with the job request before the job could be processed in the computer room. It would be necessary to ensure that the appropriate generation of media (both data and programme) are put together along with the other segments of the job. It must be emphasised that the successful running of computer jobs is dependent to a large extent on the efficiency of this particular activity.

6.2.5 Computer Processing — Once the job has been assembled, it would be sent to the computer room for processing. This stage is likely

to involve the actual running of the job, updating of certain files, generation of certain reports maintenance of accounts of various users to facilitate billing etc. In addition, in case there is any mutilation of some pieces of data, it is the computer operation staff who can facilitate retrieving the same. It is also possible that some parameter cards or media may be damaged due to which the job may have to be suspended. In such cases, the computer centre staff may have to prepare such inputs afresh, for which purpose certain data preparation devices may have to be kept within the computer room itself. The layout of the computer room would primarily be dictated by consideration of easy movement of personnel as well as magnetic storage media required for processing. In addition, trollings containing test equipment may also have to be moved about from once computer peripheral equipment to another.

6.2.5.1 The computer room should be so located within the computer complex that it is easily accessible from the other functional areas of the computer complexes. It must also be ensured that the computer room is protected from both natural and man-made hazards. The output from the computer room in the form of updated magnetic tapes, disks, cartridges, computer/output microfilms, etc, would be sent back to the media library for retention.

6.2.5.2 In the modern context, computer processing would also involve accessing and transmitting both programmes and data to remote locations through data communication channels. This requirement demands that the communication equipment be housed in a room in the immediate vicinity of the computer centre.

6.2.6 Duplicates/Archival Storage — In order to ensure that any damage to the data stored in the form of magnetic tapes and disk cartridges should not bring the operations of the computer complex to a standstill, it would be good practice to create duplicate copies of such data and store them elsewhere. In the event of a large scale damage to the main storage room, data could still be retrieved from the duplicate storage room, preferably located a few kilometres away.

6.2.7 System Maintenance — Software in the form of programmes as well as hardware in the form of equipment need to be maintained periodically. In order to achieve this, appropriate personnel housed in different rooms would have to be catered for. While the programme maintenance personnel may be located slightly further away from the computer centre proper, hardware maintenance personnel must be located within the computer centre, if necessary.

6.2.8 Output Control — All the jobs that have been processed with appropriate feedback notices from the computer centre personnel and with copies of reports generated from the computer room would now

have to be returned to the user. This activity is normally undertaken by the output control. In most of the computer centres, both input and output controls would normally be handled by only one group of personnel located within the same room.

6.3 System Support Components — Every computer complex invariably caters to undertaking turn-key information system jobs for which purpose it must have on its rolls personnel equipped with system analysis knowledge as well as programme language know-how. In addition to system analysis, computer centres would be called upon to provide consultancy in the design, development as well as maintenance of information systems by various organisations, however, tenable their relation be. Thus, the computer centres would have a group of competent personnel to provide consultancy.

6.3.1 In addition to routine maintenance activity, the system support group would be required to design new information systems on the one hand and modify existing programmes for ensuring optimal performance on the other.

6.3.2 Considering the nature of work of the various personnel of this group, one would have to provide cubicles for a few system analysis, providing at the same time a big hall for programmers.

6.4 Administrative Facility

6.4.1 In addition to the normal administrative offices handling the routine requirements of personnel working in the computer complex, specific places and rooms have to be provided for the following:

- a) Visitor's Room,
- b) Library (for storing computer books, manuals and documents).

6.4.2 The security guard room both at the main entrance to the building as well as to the computer room would also have to be provided for in the layout. Layout of power generators, telephone exchanges, etc, would have to be planned with meticulous care.

6.4.3 Apart from the other areas mentioned above, the computer centre management would have to earmark some rooms for storing 'A' class items of computer hardware spares as well as stationery, virgin tapes, disks and cartridges required for the efficient functioning and effective operations of the computer centre.

6.4.4 Since the computer staff is likely to be confined to the four walls of the computer room most of the time with strict orders not to smoke, suitable provision must be made for locating a rest/recreation room as well as a canteen in the computer complex.

7. SPECIAL REQUIREMENTS

7.1 Since many of the items handled in a computer centre such as stationary, furniture, etc, are inflammable, emergency exits meeting local regulations must be provided. With a view to avoiding fire as well as other hazards, entry of the visitors to the computer room must be restricted. However, a visitor's room may be provided with glass partitions to the computer room such that visitors may be able to watch the operations of the computer room.

7.2 The training of employees shall be a continuous process in a computer complex therefore, a class room/conference room must be provided in the computer complex. In the main computer room also there should provision of visitors gallery to show the functioning of the computer centre.

7.3 In case the computer centre is located in a hospital, the air-conditioning for the computer centre should be isolated from the air-conditioning provided for the hospital in order to avoid the possibility of infection to the computer centre personnel.

8. A TYPICAL LAYOUT

8.1 Based on the considerations and principles highlighted above, one can adopt a single unit integrated layout or plan the complex with distributed within same building on different floors or in different buildings. A typical layout is given in Fig. 2.

NOTE 1 — The layout is not to scale. Depending on requirements for various activities, areas may be allocated.

NOTE 2 — Areas marked 1, 2, 3 are Engineers' room, visitors gallery and media library respectively. These should always be provided within main computer room.

NOTE 3 — Areas marked (*) are not very critical and may be done away with if space is not available.

NOTE 4 — Areas marked (*) and (+) may be shifted to another floor or nearby building without affecting the efficiency.

NOTE 5 — Areas marked (@) may need so much space that they may have to be distributed over different floors or buildings.

9. SOME CONSTRAINTS

9.1 The layout, wherever it is constrained by modification of existing rooms will depend on factors such as the availability of space, sensitivity of environment and positions of various components like service outlets etc. However, these layouts need not be rigid while dealing with smaller computer installations. Appropriate flexibility may be adopted by the computer centre management depending upon local needs.

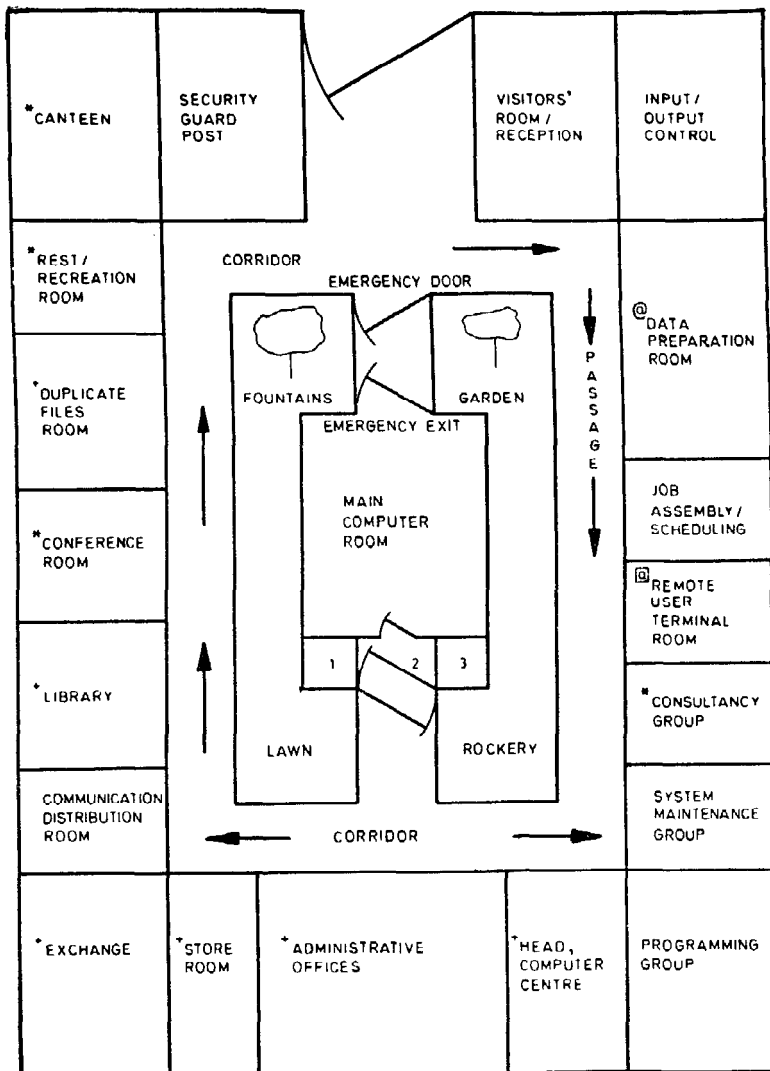


FIG. 2 TYPICAL COMPUTER CENTRE LAYOUT

9.2 In some cases, the computer centre planner is called upon to deploy various wings of the centre in different floors of a multi-storeyed building. In a typical case, he could do so by locating the computer room in the basement, input-output and data preparation rooms in the ground floor, system support group in the first floor and the administration group in the second floor. Such a layout would become necessary due to the increasing cost of land in the metropolitan cities in India and a consequent need to use different floors for different functions.